

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/15940

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 B29D31/00 B29C43/36 B29D30/48 B29C70/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 510 113 A (TAKANO HIROSHI ET AL) 9 April 1985 (1985-04-09) column 3, line 47 -column 6, line 24 figures 2,3	1-3,6
A	--- PATENT ABSTRACTS OF JAPAN vol. 009, no. 003 (M-349), 9 January 1985 (1985-01-09) & JP 59 155028 A (SUMITOMO GOMU KOGYO KK), 4 September 1984 (1984-09-04) abstract -----	1-14



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

9 February 2000

Date of mailing of the international search report

16/02/2000

Name and mailing address of the ISA

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Authorized officer

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/15940

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4510113 A	09-04-1985	JP 1456712 C	09-09-1988
		JP 58163638 A	28-09-1983
		JP 63002773 B	20-01-1988
		AT 20851 T	15-08-1986
		CA 1212807 A	21-10-1986
		EP 0090601 A	05-10-1983
JP 59155028 A	04-09-1984	JP 1497007 C	16-05-1989
		JP 63044057 B	02-09-1988

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
18 January 2001 (18.01.2001)

PCT

(10) International Publication Number
WO 01/03912 A1

(51) International Patent Classification⁷: **B29D 31/00**,
B29C 43/36, B29D 30/48, B29C 70/46

(21) International Application Number: PCT/US99/15940

(22) International Filing Date: 13 July 1999 (13.07.1999)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except US): **THE GOODYEAR TIRE & RUBBER COMPANY** [US/US];
1144 East Market Street, Akron, OH 44316-0001 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **REX, William, Allen** [US/US]; 18220 William Drive, Doylestown, OH 44230 (US). **CONGER, Kenneth, Dean** [US/US]; 1332 Homesite Drive, Stow, OH 44303 (US). **WILSON, Brian, Joseph** [US/US]; 52 Royal Avenue, Akron, OH 44303 (US).

(74) Agent: **LACHER, Frederick, K.**; Brown, Robert, W., The Goodyear Tire & Rubber Company, Patent Counsel, 1144 East Market Street, Akron, OH 44316-0001 (US).

(81) Designated States (national): AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

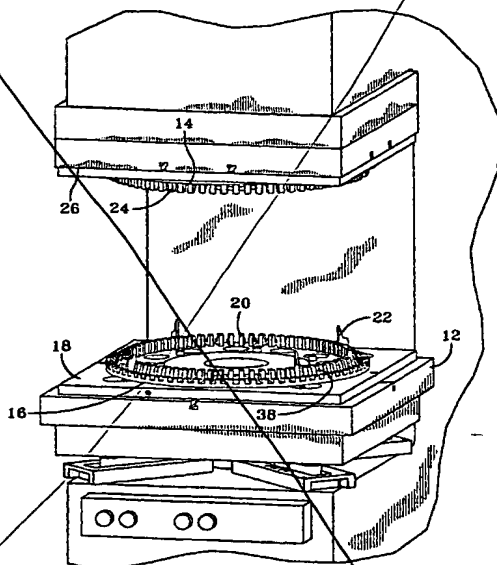
Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BEAD CURING FINGER MOLD

(57) Abstract: A tire bundle is molded in a mold cavity formed by closing a mold having upper and lower mold halves with intermeshing fingers (20, 24) for enclosing bead wires and providing a molded bead ring for placing in a bead apex mold.



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CLAIMS

1. A mold for heating and enclosing a circular member comprising an upper finger mold half, a lower finger mold half movable into engagement with said upper finger mold half to provide a mold cavity characterized by said upper finger mold half having a plurality
5 circumferentially spaced upper fingers, said lower finger mold half having a plurality of circumferentially spaced lower fingers movable into meshing engagement with said upper fingers upon closing of said mold by movement of said lower finger mold half towards said upper finger mold half providing a circular mold cavity for said circular member.
2. A mold according to claim 1 further characterized by said upper fingers and said lower
10 fingers having sloped edges for guiding and compressing said circular member in a central position upon closing of said mold.
3. A mold according to claim 2 further characterized by said upper fingers and said lower fingers having molding surfaces providing a circumferentially continuous molding member surface of said mold with a precise predetermined diameter of said circular member upon closing
15 of said mold.
4. A mold according to claim 3 wherein said circular member is a tire bead having a plurality of wires wrapped in a bead bundle and coated with a resilient rubber-like material further characterized by means for heating said mold for vulcanizing said resilient rubber-like material.
5. A mold according to claim 3 further characterized by said upper fingers and said lower
20 fingers having extensions extending beyond said molding surfaces for guiding said circular member and providing recesses for receiving said extensions in the closed condition of said mold.
6. A bead curing finger mold characterized by a plurality of circumferentially spaced lower fingers disposed in a lower finger mold half, a plurality of circumferentially spaced upper fingers disposed in an upper finger mold half, said lower finger mold half being positioned in a generally
25 horizontal position for supporting a bead bundle, and said upper finger mold half being positioned over said lower finger mold half with said lower fingers being interposed between said upper fingers in a closed position of said mold for containing and guiding said bead bundle and providing spaces along said lower fingers and said upper fingers to accommodate variations in size of said bead bundle.
7. A bead curing finger mold according to claim 6 further characterized by said lower finger
30 mold half being raised to close said mold and said upper finger mold half has spaced apart spring

loaded ejector fingers for retracting upon closing of said mold and for extension upon opening of said mold to transfer said bead bundle to said lower finger mold half.

8. A bead curing finger mold according to claim 6 further characterized by said lower finger mold half having circumferentially spaced apart ejectors and bead holders extending upwardly through said lower finger mold half for holding said bead bundle in the lower position of said lower finger mold half prior to closing of said mold and ejecting said bead bundle upon lowering of said upper mold half after vulcanization of said bead bundle.

9. A tire bead comprising multiple revolutions of metal wires coated with rubber and wound in a circular configuration to form a bead bundle characterized by said bead bundle being cured in a bead curing finger mold having a plurality of circumferentially spaced lower fingers disposed in a lower finger mold half in a generally horizontal lower position for supporting said bead bundle, a plurality of circumferentially spaced upper fingers disposed in a generally horizontal upper finger mold half positioned over said lower finger mold half with said lower fingers interposed between said upper fingers in the closed position of said mold for straightening said wires of said bead bundle and providing spaces along said lower fingers and said upper fingers to accommodate variations in size of said bead bundle during vulcanization of said bead upon application of heat to said bead curing finger mold.

10. The tire bead of Fig. 9 further characterized by said lower fingers and said upper fingers having tapered bead bundle engaging surfaces in converging relationship upon closing movement of said upper finger mold half and said lower finger mold half for compressing said metal wires during closing of said bead curing finger mold.

11. The tire bead bundle, according to claim 10 further characterized by said lower fingers and said upper fingers having radially extending surfaces for overlapping said bead during closing of said finger mold to limit the closing movement of said lower finger mold half relative to said upper finger mold half and determine the closing movement of the bead curing finger mold.

12. A tire bead according to claim 10 wherein the angle of taper is from 0 to 45 degrees from a vertical axis of said lower finger mold half.

13. A tire bead according to claim 12 further characterized by the angle of taper being 15 degrees.

14. A method and apparatus substantially as described herein or as shown in the accompanying drawings.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference DN1999131	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/US 99/ 15940	International filing date (day/month/year) 13/07/1999	(Earliest) Priority Date (day/month/year)
Applicant THE GOODYEAR TIRE & RUBBER COMPANY et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (see Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☒ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

1

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 99/ 15940

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A tire bundle is molded in a mold cavity formed by closing a mold having upper and lower mold halves with intermeshing fingers (20,24) for enclosing bead wires and providing a molded bead ring for placing in a bead apex mold.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/15940

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IPC 7 B29D31/00 B29C43/36 B29D30/48 B29C70/46

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 B29D B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 510 113 A (TAKANO HIROSHI ET AL) 9 April 1985 (1985-04-09) column 3, line 47 -column 6, line 24 figures 2,3	1-3,6
A	PATENT ABSTRACTS OF JAPAN vol. 009, no. 003 (M-349), 9 January 1985 (1985-01-09) & JP 59 155028 A (SUMITOMO GOMU KOGYO KK), 4 September 1984 (1984-09-04) abstract	1-14

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search

9 February 2000

Date of mailing of the international search report

16/02/2000

Name and mailing address of the ISA

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Authorized officer

Bibollet-Ruche, D

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/15940

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4510113	A	09-04-1985	JP 1456712 C	09-09-1988
			JP 58163638 A	28-09-1983
			JP 63002773 B	20-01-1988
			AT 20851 T	15-08-1986
			CA 1212807 A	21-10-1986
			EP 0090601 A	05-10-1983
JP 59155028	A	04-09-1984	JP 1497007 C	16-05-1989
			JP 63044057 B	02-09-1988

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

RECD 14
14
2001

WIPO

PCT

Applicant's or agent's file reference DN1999131	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US99/15940	International filing date (day/month/year) 13/07/1999	Priority date (day/month/year) 13/07/1999
International Patent Classification (IPC) or national classification and IPC B29D31/00		
Applicant THE GOODYEAR TIRE & RUBBER COMPANY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 08/02/2001	Date of completion of this report 06.07.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer De Waard, W Telephone No. +49 89 2399 2918 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/US99/15940

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-4 as originally filed

Claims, No.:

1-13 with telefax of 13/06/2001

Drawings, sheets:

1/6-6/6 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/US99/15940

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-13
	No: Claims
Inventive step (IS)	Yes: Claims 1-13
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-13
	No: Claims

- 2. Citations and explanations**
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/US99/15940

R It m V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Although indicated with category X in the search, US-A-4,510,113 (hereinafter referred to as D1) is not seen as of particular relevance for the claimed invention.

The most striking differences between the invention and D1 are the upper and lower **fingers** and their **meshing** engagement upon closing the mould (emphasis added).

Re Item VIII

Certain observations on the international application

The claims as a whole are not concise (Article 6 PCT, Guidelines C III-4.1).

Although slightly different wording has been used, claim 6 appears to be a dependent claim of claim 1, especially directed to a (tire) bead.